IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of
Khalil AMINE *et al.*

Serial No.: 10/084,573

Filed: February 27, 2002

Date: May 19, 2004

Docket No. 051583-0245

Group Art Unit: ~~1802~~ 1772 5/19/2004

Examiner: W. Aughenbaugh

For: **PACKAGING FOR PRIMARY AND SECONDARY BATTERIES**

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 on May 19, 2004.

Joseph P. Meara
(Name of Applicant, assignee or Registered Representative)

Joseph P Meara
(Signature)

May 19, 2004
(Date of Signature)

DECLARATION UNDER 37 C.F.R. §1.132 OF ANDREW N. JANSEN

I, Andrew N. Jansen, state and declare that:

1. I am a citizen of the United States of America, residing at 2 Langford Court, Bolingbrook, Illinois.

2. I am an employee of Argonne National Laboratories located near Chicago, Illinois.

3. I have worked in the field of batteries for over eleven years and in the battery packaging industry for over four years.

4. I am a co-inventor of U.S. Application Serial No. 10/084,573 ("the application"). I have reviewed the Office Action, mailed February 25, 2004, and the prior art cited therein.

5. The present invention relates to packaging for the containment of primary and secondary batteries and for the fabrication of such packaging. At the time the invention was made, flexible housings for batteries had met with limited success because the metal foil containing laminates used in such housings did not entirely prevent the transmission of water through the housing. The resulting decomposition products from electrolytes, such as hydrofluoric acid, could escape through the laminates and result in the breach of the battery housing.

6. As stated in paragraph 28 of the application, metal foils inherently have pinholes in them that are leakage points for solvent to exit the packaging and could cause battery failure due to corrosion induced rupturing at these points. Figure 1 of the attached Appendix shows a traditional laminate with an exterior layer at the top, single metal foil layer in the middle and an interior sealant layer. The pinhole defect in the metal foil permits molecules of the electrolyte to diffuse across the laminate structure; conversely, water and air may diffuse into the interior of the battery. The number of pinholes generally decreases as the thickness of the metal foil increases. However, increasing foil thickness to eliminate the pinholes is not always appropriate for flexible battery housings as this leads to: (a) reduced flexibility of the packaging; (b) inability to heat seal due to the thermal conduction of heat by the thicker metal; and (c) increased packaging weight and cost.

7. Figure 2 shows a laminate that includes a barrier layer of the claimed invention. The barrier layer is formed from two separate and distinct metal foils which may be laminated together. Because two metal foils are separate prior to formation of the laminate, they will each include pinholes that do not align with each other. Thus, a molecule diffusing through a pinhole in one metal foil must travel a longer path before diffusing out of a pinhole in the second metal foil. This process significantly slows the diffusion of solvents out of the battery housing and air and moisture into the battery housing. Thus, two metal foils with a combined

thickness less than that of a single foil will perform better than the thicker single foil as shown in Figure 6 of the application.

8. Kurfman (U.S. Patent No. 4,612,216) describes a method for making metallized plastic films in which a duplex metal alloy layer is attached to a polymeric layer. To form the duplex metal alloy, Kurfman describes a number of processes for depositing one metal layer on another (col. 10, lines 10-61). These include, for example, an electroless process, a vacuum deposition technique, sputter coating, electroplating, and ion plating. One skilled in the art would understand that in each of these processes, any defect, such as a pinhole, on the surface of the first metal layer will be propagated onto the surface of the second metal layer as it is deposited. This effect is produced because the second metal can only be deposited on the surface of the first metal and generally does not bridge or cover the pinhole. In addition, the deposition processes do not provide any space between the two layers into which molecules of solvent air or moisture may diffuse. Instead, the two metal layers form an inseparable intermetallic alloy at the interface between the layers. The foil produced by the method of Kurfman is as shown in Figure 3: a single foil with an abrupt change of composition from one surface to the other. The two layer foil of Kurfman retains the pinhole defects of the first layer and fails to impede the path that molecules travel when diffusing across the metal foil. As one skilled in the art would understand, the foil of Kurfman functions as a single foil rather than the two separate foils of the invention.

9. Kurfman also describes an alternative procedure for preparing a duplex metal alloy (col. 12, lines 3-11) that involves depositing the first metal layer on a first polymer layer and the second metal layer on a second polymer layer. The first and second metal layers are then fusion bonded by application of heat and pressure (i.e. the surfaces of the two metals melt and again form an intermetallic alloy). One skilled in the art would understand that this procedure also results in a single metal foil with no space between the layers of metal.

10. In some embodiments of the claimed invention, a polymeric adhesive is used to bond the two metal foils of the barrier layer together. The adhesive improves performance of the two metal foils by creating a tortuous path for the diffusing molecules to take. In addition, the adhesive may contain absorbent material that can trap diffusing molecules

between the foils. The intermetallic layer of Kurfman, being an alloy of the two metals, cannot function in the same fashion.

11. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or of any patent resulting therefrom.

Date: May 19, 2004 By: Andrew N. Jansen
Andrew N. Jansen

APPENDIX

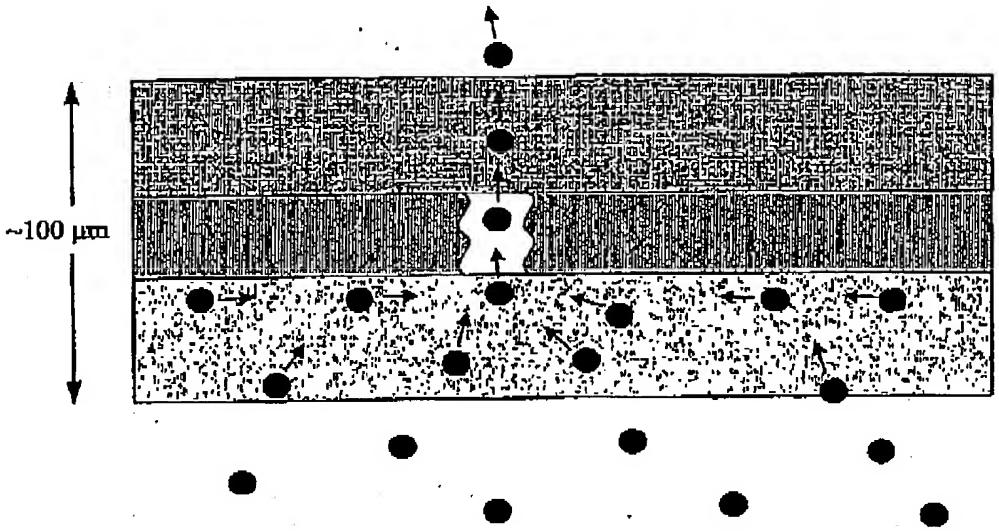

Fig. 1: Single Foil Barrier

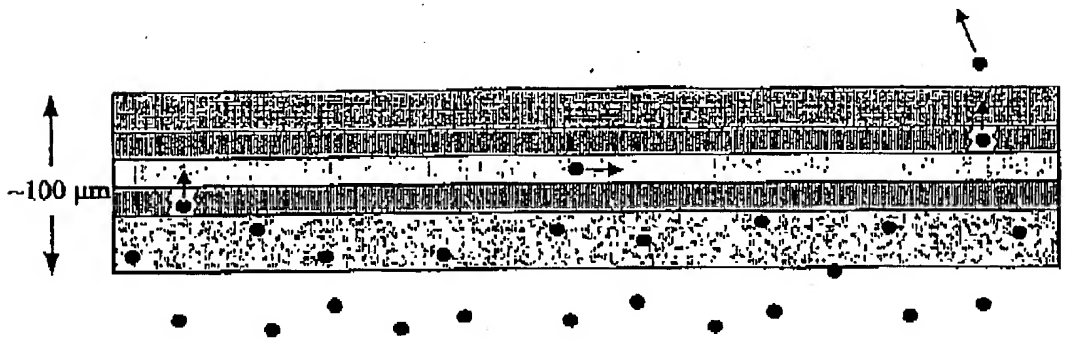

Fig. 2: Two Foil Barrier

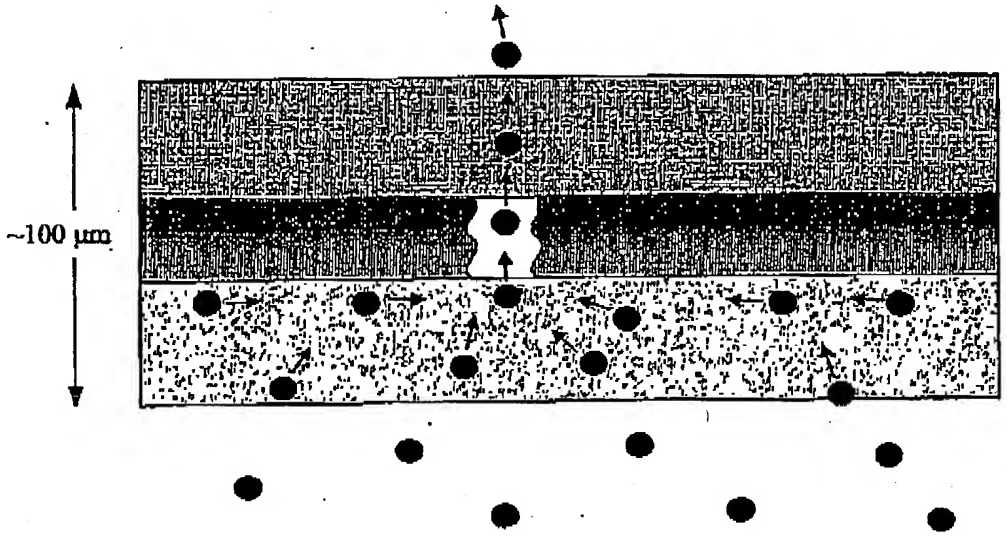

Fig. 3: Single Foil Barrier Having 2 Layers